Using Digital Manufacturing Certificates for Authorization, Authentication & Traceability of Product Data

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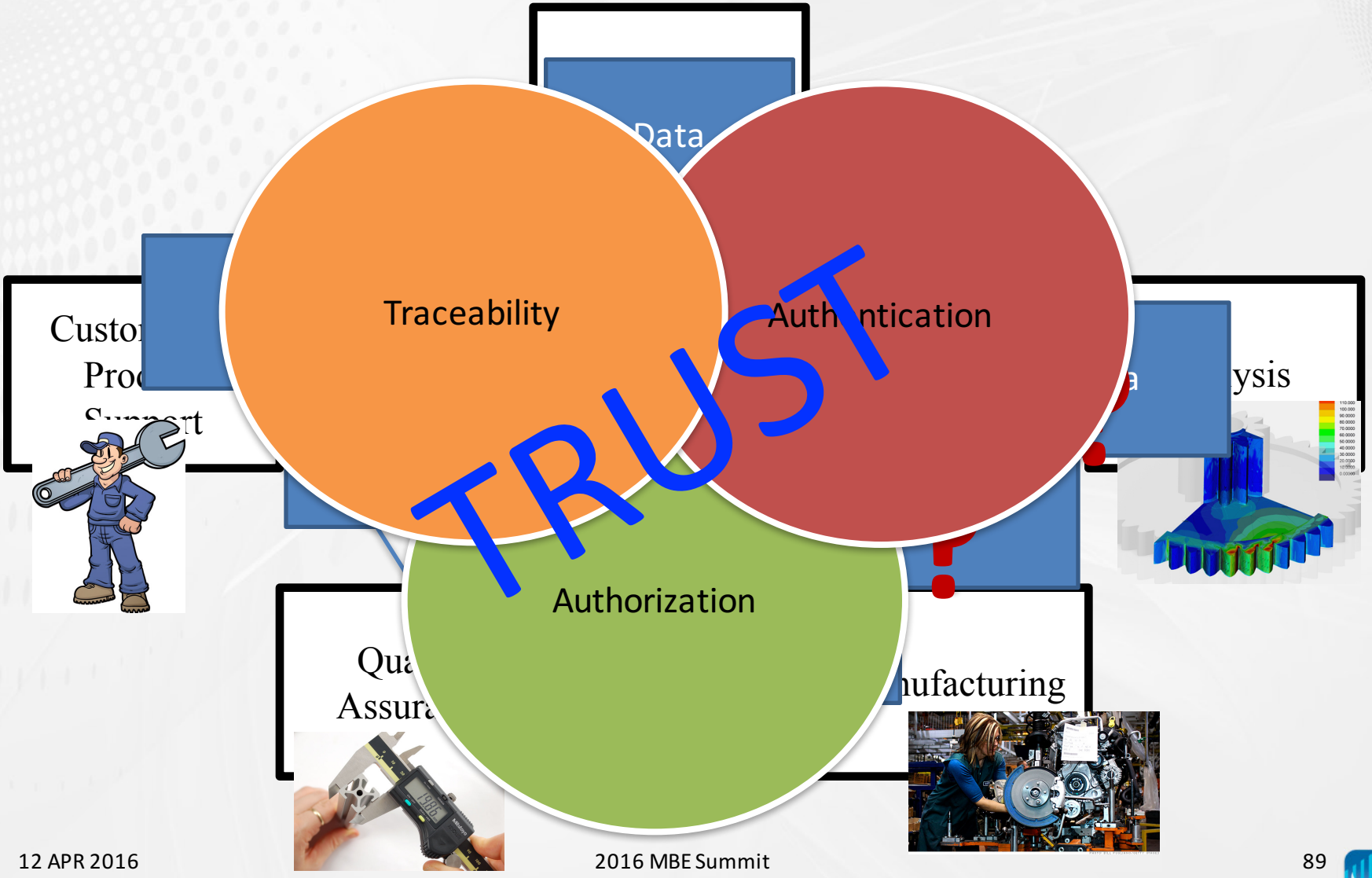
Objective


Data
Traceability
Authentication
TRUST
Authorization
Custo
Proc
Support
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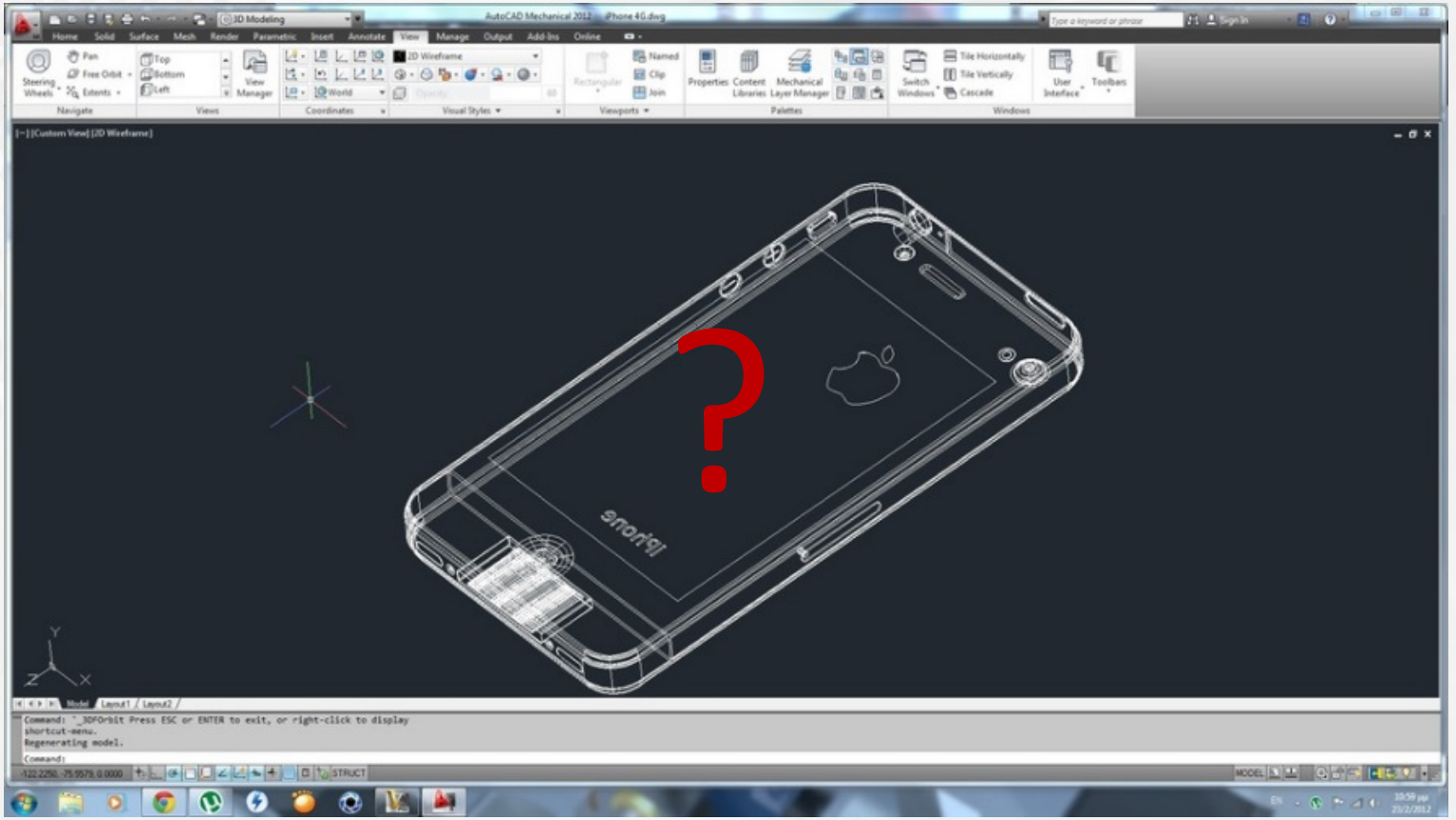
nufacturing

Objective

- Authentication: WHO did *what* to whom?
  - Sylvere *acknowledges* that XYZ-123 is his design
- Authorization: WHAT can be done to whom?
  - Tom *approves* Sylvere's design XYZ-123 to be used for production
- Traceability: Where/When was this done?
  - On April 1st, Tom approved XYZ-123 to be used for production

Problem



Requirements

- Reliable (R1)
  - If the data is altered after embedding information, trust is broken!
- Flexible mechanism to embed Trust metadata (R2)
  - Everyone has their own flavor of metadata
- Support standard formats for digital product data (R3)

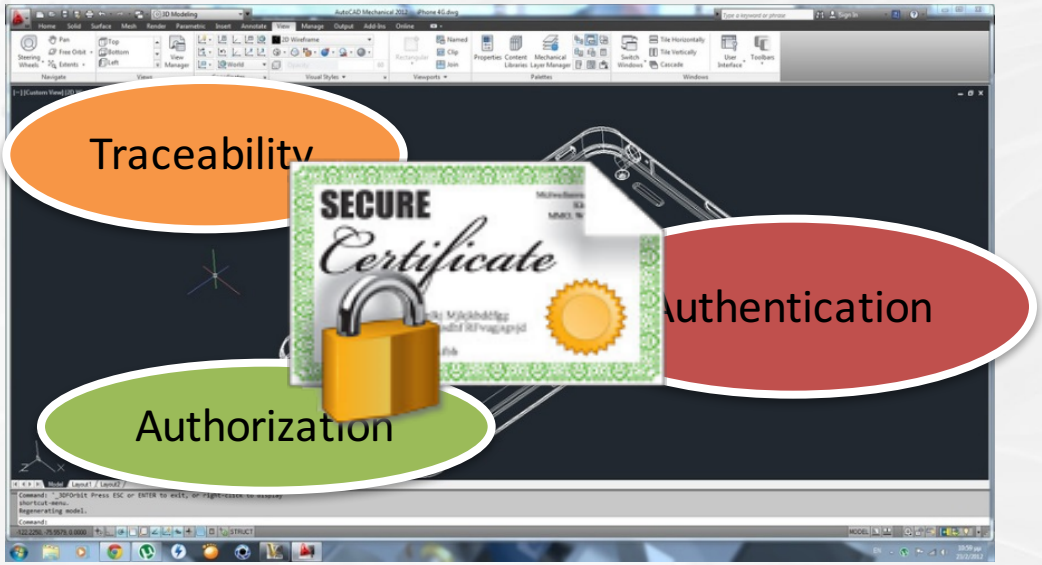
Our approach

- Reliable (R1)
  - Identify when data has been altered
- Leverage X.509 certificates and digital signature mechanism
  - standardized and proven
- Flexible (R2)
  - Cannot support new metadata “on the fly”
- Support from product data standards (R3)
  - Weak

Our approach (2)

- Killed two birds with one ***stone***
  - ***Extended*** product data standards to embed trust metadata (R3)
    - ISO 10303 STEP
    - QIF
  - ***Extensions*** are generic and support infinity of metadata (R2)

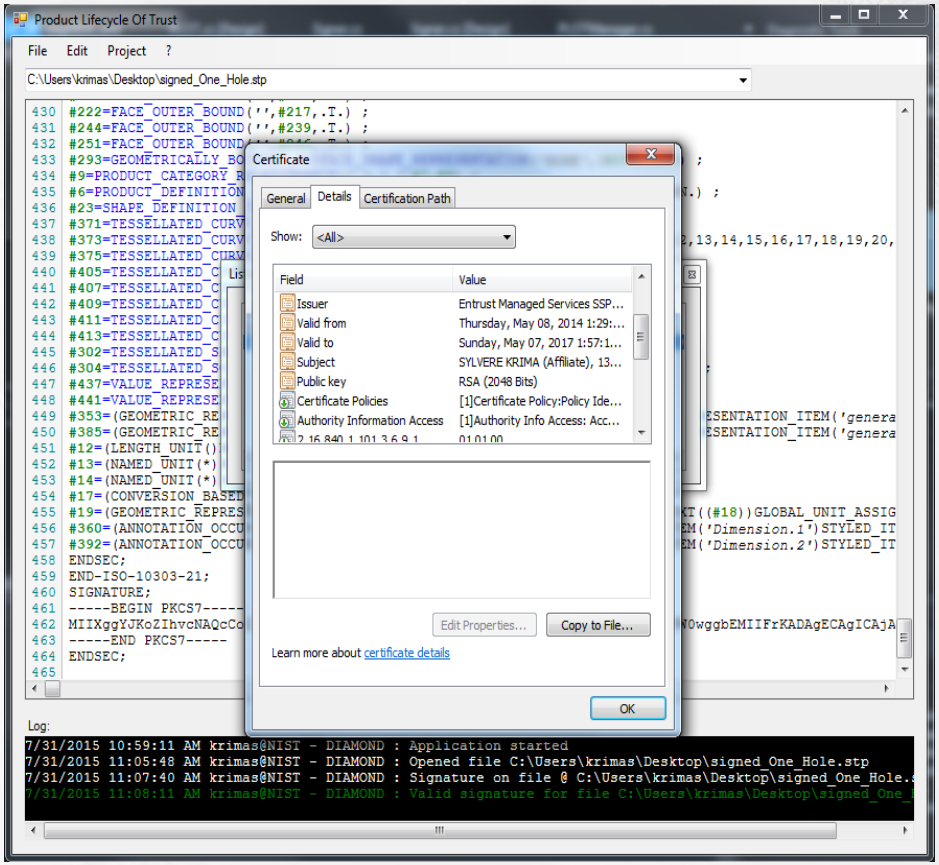
Our approach (3)




```
TRACE:#3421
#3422 = PKCS_TRACE({source:`URI:15.1115\734.13.phone',
       date:`17-FEB-2016', operation:`validation',
       usage:`development', result:`pass with warnings',
       report:`URI:15.1115\734.13.phone.validation'})
#3423 = PKCS(`pkcs7_signature',Y,[#3415,#3418])
ENDSEC;
```

Digital Manufacturing Certificate Toolkit

- Toolkit includes a User Interface and API for Reading, Writing, and Verifying digital signatures in models



- Supports G-Code (ISO 6983), QIF 2.1, PDF/PRC, and STEP P21 formats

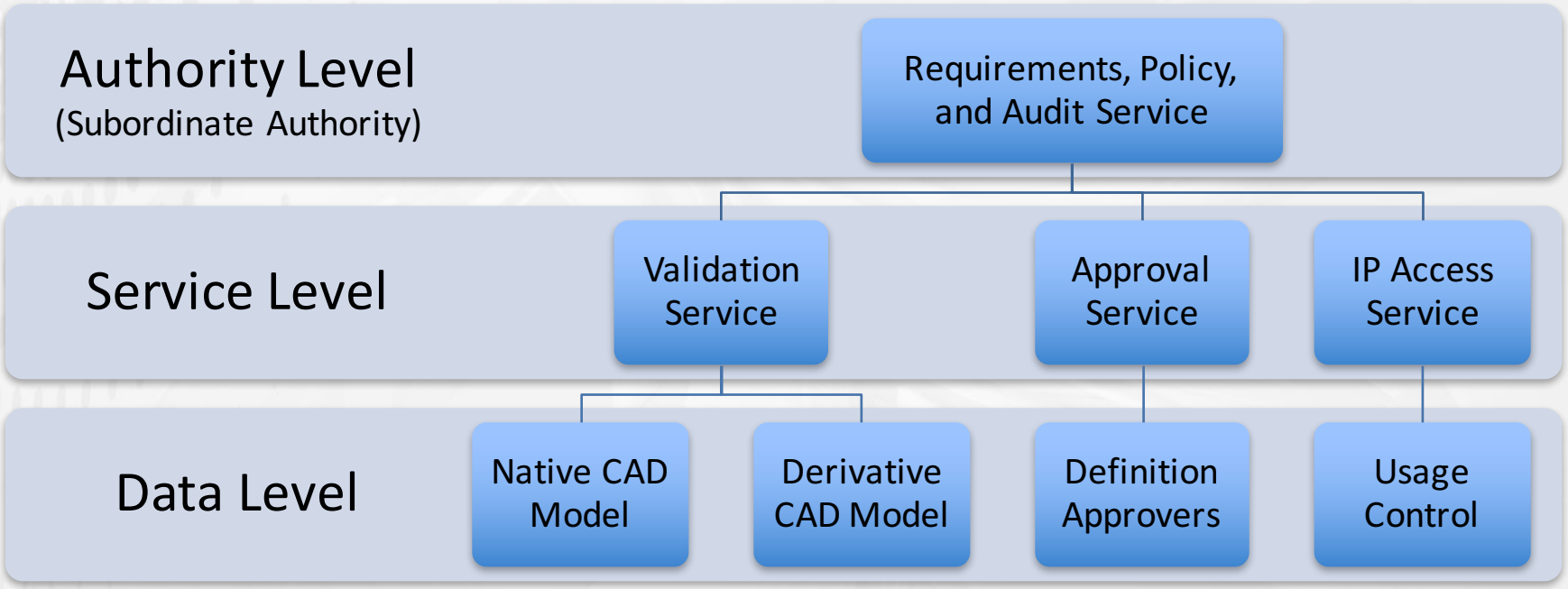
- Toolkit and source code available at: https://github.com/usnistgov/DT4SM

Our contributions

- Extensions to product data standards for embedding trust metadata
- Easy adoption by manufacturers (Toolkit)
- Faster implementation by solution providers (API)

Lastly, Proposing a Product Lifecycle of Trust

A concept inline with X.509 Private Key Infrastructure and Privilege Management Infrastructure as an all-in-one solution



A system based on Authorization with embedded Authentication.

(what the data is) **(how the data can is used)**